Claims

1. Rare-earth doped fiber amplifier comprising a double-clad fiber comprising a core having a first refractive index, an inner cladding surrounding the core and having a second refractive index lower than the first refractive index and an outer cladding surrounding the inner cladding, said core being doped with Erbium, co-doped with Ytterbium, and further co-doped with Cerium.

2. Fiber amplifier according to claim 1, further comprising a pump source coupled to the double-clad fiber to emit pump energy in the form of light into the inner cladding of the fiber.

3. Fiber amplifier according to claim 2, wherein the pump source emits light in the wavelength band between 910nm and 1060nm.

4. Fiber amplifier according to claim 2, wherein the pump source emits light with one or any combinations of peaks in the wavelength spectrum at either of the wavelengths 915nm, 975nm or 1060nm.

5. Fiber amplifier according to claim 1, wherein the Cerium enables a resonant energy transfer between the Erbium excited state $^4I_{11/2}$ and Cerium ground state $^2F_{7/2}$.

6. Fiber amplifier according to claim 1, wherein the Ytterbium enables pump energy transfer between Ytterbium ions being in the excited state and Erbium ions being in the ground state $^4I_{15/2}$.

7. Fiber amplifier according to claim 1, wherein the fiber core is made of silica glass.

8. Fiber amplifier according to claim 1, wherein the inner cladding comprises regions with locally modified refractive index such as holes for directing light to the fiber core.

9. Fiber amplifier according to claim 1, wherein the doping concentration of Erbium in the core lies between 500 and 2500 ppm wt, the Ytterbium concentration is between one to 100 times the Erbium concentration. and the Cerium concentration is between one to 30 times the Erbium concentration.

10. Fiber amplifier according to claim 9, wherein the Ytterbium concentration is between 10 to 30 times the Erbium concentration. and the Cerium concentration is substantially 20 times the Erbium concentration.

11. Fiber amplifier according to claim 1, used as a booster at the wavelength range between 1527nm and 1565nm.

12. Fiber amplifier according to claim 11, further operable at the wavelength range between 1565nm and 1610nm.

13. Double-clad fiber comprising a core having a first refractive index, an inner cladding surrounding the core and having a second refractive index lower than the first refractive index and an outer cladding surrounding the inner cladding, the core being doped with Erbium, co-doped with Ytterbium, and further co-doped with Cerium.

14. Double-clad fiber according to claim 13, wherein the Cerium enables a resonant energy transfer between the Erbium excited state $^4I_{11/2}$ and Cerium ground state $^4F_{7/2}$.

15. Double-clad fiber according to claim 13, wherein the Ytterbium enables pump energy transfer between Ytterbium ions being in the excited state and Erbium ions being in the ground state $^4I_{15/2}$.

16. Double-clad fiber according to claim 13, wherein the fiber core is made of silica glass.

17. Double-clad fiber according to claim 13, wherein the doping concentration of Erbium in the core lies between 500 and 2500 ppm wt, the Ytterbium concentration is between one to 100 times the Erbium concentration. and the Cerium concentration is between one to 30 times the Erbium concentration.

18. Double-clad fiber according to claim17, wherein the Ytterbium concentration is between 10 to 30 times the Erbium concentration. and the Cerium concentration is substantially 20 times the Erbium concentration.